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BIASED ESTIMATION IN REGRESSION

Grant No. AFOSR-75-2871

FINAL REPORT

Research efforts that were conducted under the auspices of this grant from the U.S. Air Force Office of Scientific Research produced major advances in the theory and application of biased regression methodology. Completed research activities have resulted in the publication of over a dozen scholarly papers in referred scientific journals as well as the distribution of over a half-dozen technical reports and proceedings papers. Approximately twenty oral presentations, many of which were invited talks, were delivered on topics that were studied during the grant period. A textbook on applied regression analysis is also in preparation.

Important theoretical advances were obtained for the latent root, principal component, and ridge estimators of the parameters of multiple linear regression models. Specifically, theoretical comparisons among these estimators and the classical least squares estimator revealed that the biased estimators offer great potential for more accurate estimation than least squares when predictor variables are multicollinear. Among the biased estimators, all three compete favorably over a wide range of model configurations with each being able to estimate more accurately than the others for certain types of model configurations.

Special emphasis has been directed toward the investigation of the latent root regression estimator. Its theoretical effacacy and asymptotic properties have been developed and its potential for improvement over other biased estimators has been shown.

Application of biased regression methodology has also been stressed in several research studies. Guidelines for the implementation of all three biased estimators mentioned above have been proposed. In particular, the determination of nonpredictive multicollinearities and subsequent formulation of the latent root estimator has been studied. The inadequacy of inference procedures for the principal component estimator has been documented. Nonstochastic selection rules for the ridge estimator - which enable the exact theoretical properties to remain valid - have also been studied.